An iPhone-like platform for bringing population health to the point of care

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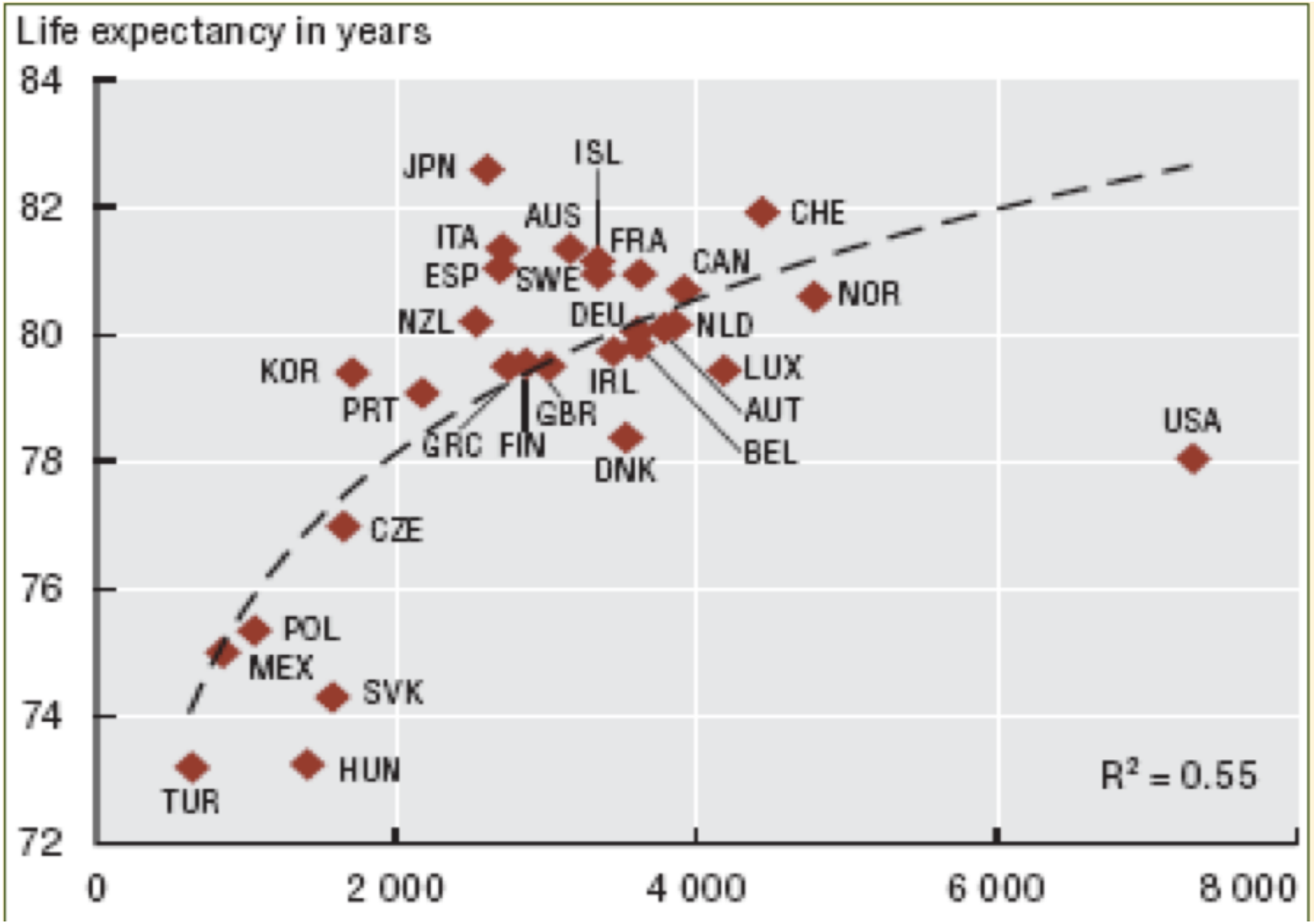
- $2.5 Trillion
- 17% GDP

- Low return on investment
  - ✓ 24th Life expectancy at birth
  - ✓ 29th Infant mortality
  - ✓ 37th System performance
  - ✓ 1/3 spent on activities that do not improve patient outcomes
  - ✓ Inconsistent use of effective interventions

US Spending per capita vs. Life Expectancy



Biased Evidence—two examples

- Publication bias
  - ✓ Negative studies aren't published
- Industry funded trials
  - ✓ Are less likely published within 2 years of completion
  - ✓ Are more likely to publish reported favorable outcomes

Annals of Internal Medicine 2010

As per the National Coordinator . . .

- New England Journal of Med 2008: Low uptake of HIT in ambulatory setting
- New England Journal of Med 2009 Low uptake in of HIT in hospitals

Conclusion: $48B investment, pushing the technology

Medicare Meaningful Use Incentive Payment Schedule

Calendar Year	First Calendar Year in which the Eligible Professional Receives an Incentive Payment				
	2011	2012	2013	2014	2015 +
2011	$18,000	------	------	------	------
2012	$12,000	$18,000	------	------	------
2013	$8,000	$12,000	$15,000	------	------
2014	$4,000	$8,000	$12,000	$12,000	------
2015	$2,000	$4,000	$8,000	$8,000	$0
2016	-----	$2,000	$4,000	$4,000	$0
TOTAL	$44,000	$44,000	$39,000	$24,000	$0

Cap applies for any eligible professional with at least $24,000 in Medicare Part B allowable charges in each payment year

The Goal:

A Learning Health System

But investment is in current stage technologies:
No data in or out, no communication, terrible UIs

ORIGINAL CONTRIBUTION

Role of Computerized Physician Order Entry Systems in Facilitating Medication Errors

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ADVERSE DRUG EVENTS (ADEs) are estimated to injure or kill more than 770 000 people in hospitals annually.[1] Prescribing errors are the most frequent source.[2-5] Computerized physician order entry (CPOE) systems are widely viewed as crucial for reducing prescribing errors[2,3,6-17] and saving hundreds of billions in annual costs.[18,19] Computerized physician order entry system advocates include researchers, clinicians, hospital administrators, pharmacists, business councils, the Institute of Medicine, state legislatures, health care agencies, and the lay public.[2,3,6-10,12,14-17,20-22] These systems are expected to become more prevalent in response to resident working-hour limitations and related care discontinuities[23] and will supposedly offset causes (eg, job dissatisfaction) and effects

Context Hospital computerized physician order entry (CPOE) systems are widely regarded as the technical solution to medication ordering errors, the largest identified source of preventable hospital medical error. Published studies report that CPOE reduces medication errors up to 81%. Few researchers, however, have focused on the existence or types of medication errors facilitated by CPOE.

Objective To identify and quantify the role of CPOE in facilitating prescription error risks.

Design, Setting, and Participants We performed a qualitative and quantitative study of house staff interaction with a CPOE system at a tertiary-care teaching hospital (2002-2004). We surveyed house staff (N=261; 88% of CPOE users); conducted 5 focus groups and 32 intensive one-on-one interviews with house staff, information technology leaders, pharmacy leaders, attending physicians, and nurses; shadowed house staff and nurses; and observed them using CPOE. Participants included house staff, nurses, and hospital leaders.

Main Outcome Measure Examples of medication errors caused or exacerbated by the CPOE system.

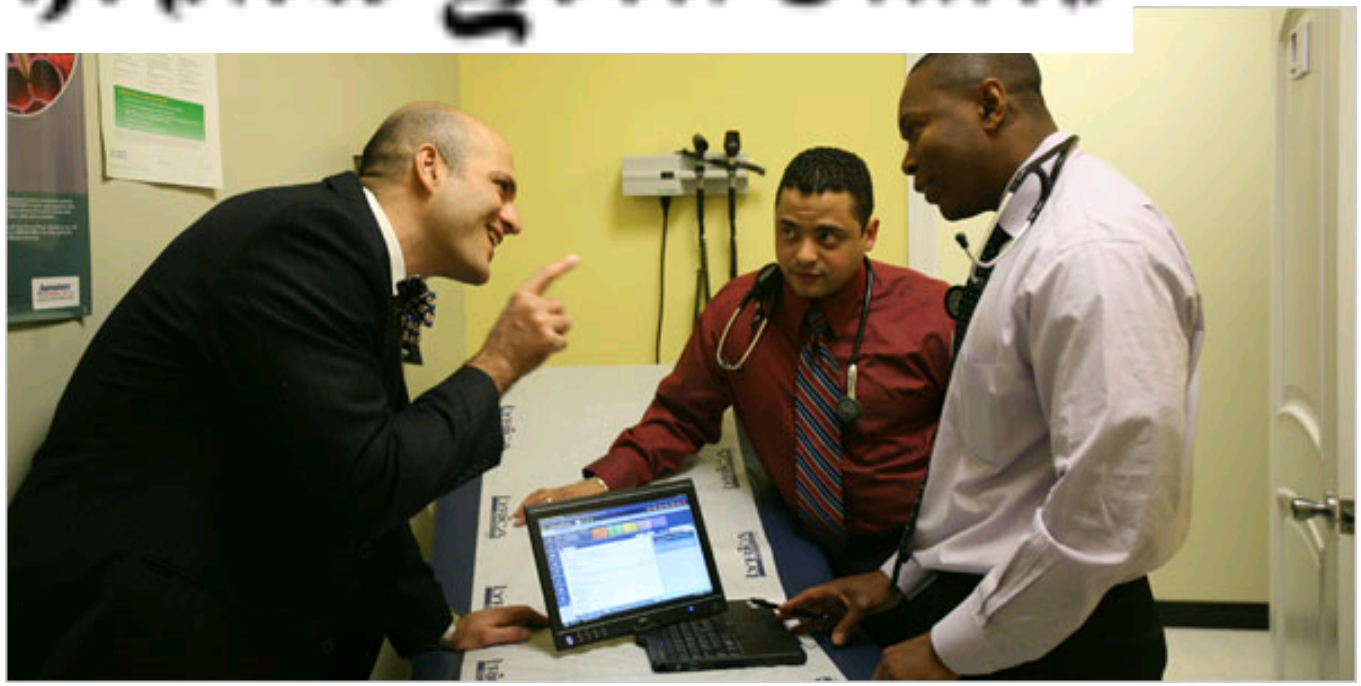
Results We found that a widely used CPOE system facilitated 22 types of medication error risks. Examples include fragmented CPOE displays that prevent a coherent view of patients' medications, pharmacy inventory displays mistaken for dosage guidelines, ignored antibiotic renewal notices placed on paper charts rather than in the CPOE system, separation of functions that facilitate double dosing and incompatible orders, and inflexible ordering formats generating wrong orders. Three quarters of the house staff reported observing each of these error risks, indicating that they occur weekly or more often. Use of multiple qualitative and survey methods identified and quantified error risks not previously considered, offering many opportunities for error reduction.

Conclusions In this study, we found that a leading CPOE system often facilitated medication error risks, with many reported to occur frequently. As CPOE systems are implemented, clinicians and hospitals must attend to errors that these systems cause in addition to errors that they prevent.

JAMA. 2005;293:1197-1203 www.jama.com

The New York Times

March 1, 2009



"There's no way small practices can effectively implement electronic health records on their own."

"This is not the iPhone."

The NEW ENGLAND JOURNAL of MEDICINE

Later in March

No Small Change for the Health Information Economy

Kenneth D. Mandl, M.D., M.P.H., and Isaac S. Kohane, M.D., Ph.D.

The economic stimulus package signed by President Barack Obama on February 17 included a $19 billion investment in health information technology. How can we best take advantage of this unprecedented opportunity to computerize health care and stimulate the health information economy while also stimulating the U.S. economy? A health care system adapting to the effects of an aging population, growing expenditures, and a diminishing primary care workforce needs the support of a flexible information infrastructure that facilitates innovation in wellness, health care, and public health.

Flexibility is critical, since the system will have to function under new policies and in the service of new health care delivery mechanisms, and it will need to incorporate emerging information technologies on an ongoing basis. As we seek to design a system that will constantly evolve and encourage innovation, we can glean lessons from large-scale information-technology successes in other fields. An essential first lesson is that ideally, system components should be not only interoperable but also substitutable.

The Apple iPhone, for example, uses a software platform with a published interface that allows software developers outside Apple to create applications; there are now nearly 10,000 applications that consumers can download and use with the common phone interface. The platform separates the system from the functional-

$15M ONC-FUNDED RESEARCH PROJECT

Clinical use case 1

Med-tastic is a well-funded NewCo which has developed an elegant medication list application that has physician and consumer facing functionality

To work, Med-tastic needs

- Prescribing history
- Dispensed medication history
- Allergies
- Problem list diagnoses

Use case 2

White Coat Notes

News from the Boston-area medical community

< Back to front page

Text size

CHILDRENS, HARVARD UNIVERSITY

Electronic medical records give early warning of domestic abuse

Posted by Elizabeth Cooney September 29, 2009 07:09 PM

E-mail | Link | Comments (0)

Boston researchers reported today a novel use for electronic medical records -- using data in patient records, they say they were able to identify likely victims of domestic abuse an average of two years before a diagnosis was actually made.

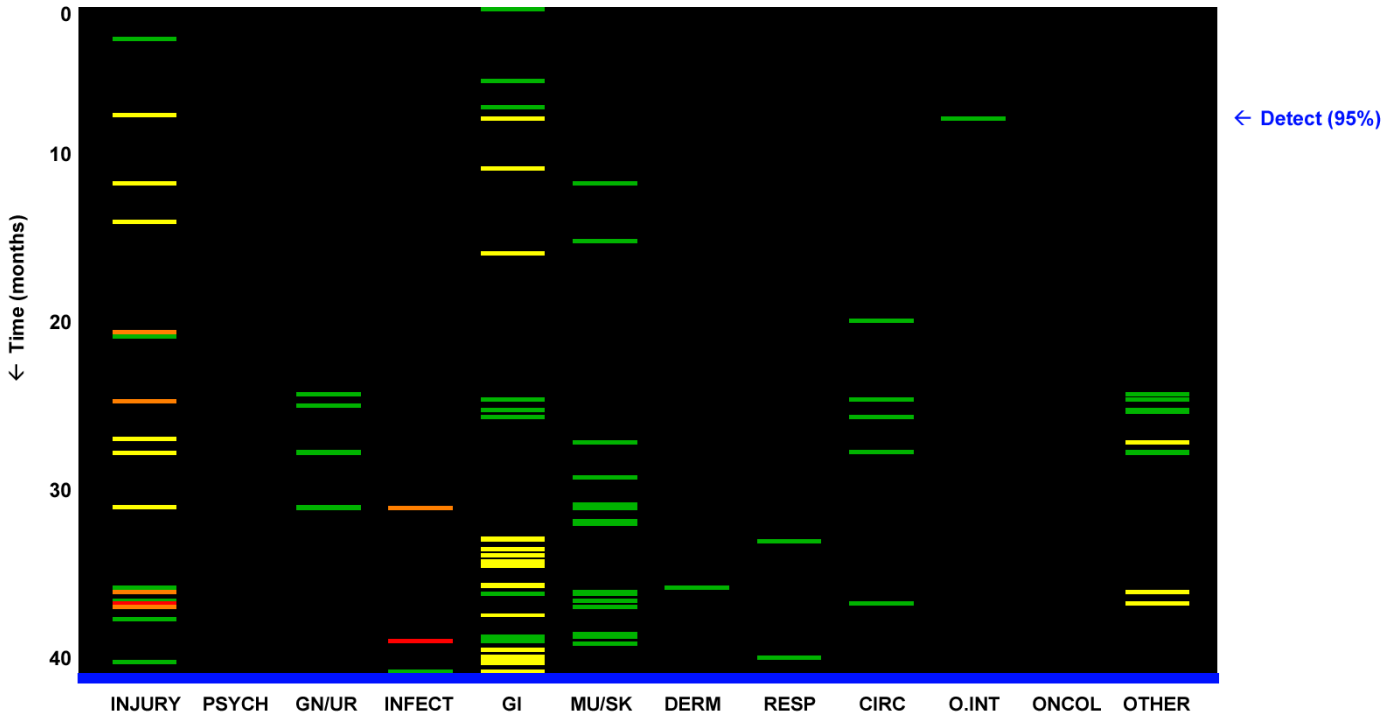
Ben Reis, **Dr. Isaac Kohane**, and **Dr. Kenneth Mandl** of **Children's Hospital Boston** and **Harvard Medical School** studied six years of hospital admissions and emergency visits for patients over 18 years old. Based on the patient's history, including injuries and assaults, they determined whether patients met a definition of domestic abuse. Then they looked at actual diagnoses of domestic abuse.

"Our model predicted abuse two years before it appeared on medical records," Reis said in an interview. The article appears online in the British Medical Journal.

The risk factors linked to a future domestic abuse diagnosis differed between men and women. For women, the red flags were trips to the hospital to treat injuries, poisoning, and alcoholism. For men, depression and psychosis were associated with the greatest risk.

The researchers developed a visual display that could become part of a patient's electronic health record. The work is not ready to be implemented, they said, but the model could form the basis for an early warning system that would help busy doctors decide which patients need further screening and perhaps intervention.

Domestic Abuse



British Medical Journal 2009

Use case 2 (cont)

- The application would require
  - ✓ Comprehensive diagnostic data from primary site of care for each patient (to work well)
  - ✓ Comprehensive diagnostic data from all sites of care (to work very well)

- MedTastic may be able to develop apps adapted to several APIs (Cerner's Mpages etc)
- Academic group cannot.
- THEREFORE, focus is on an API that enables a single apps store for
  - ✓ Cerner Install
  - ✓ Hospital with homegrown system
  - ✓ Physician practice
  - ✓ Open source EMR

We imagine EMRs as an iPhone-like platform where Medtastic could create and widely distribute an app across many disparate EMRs

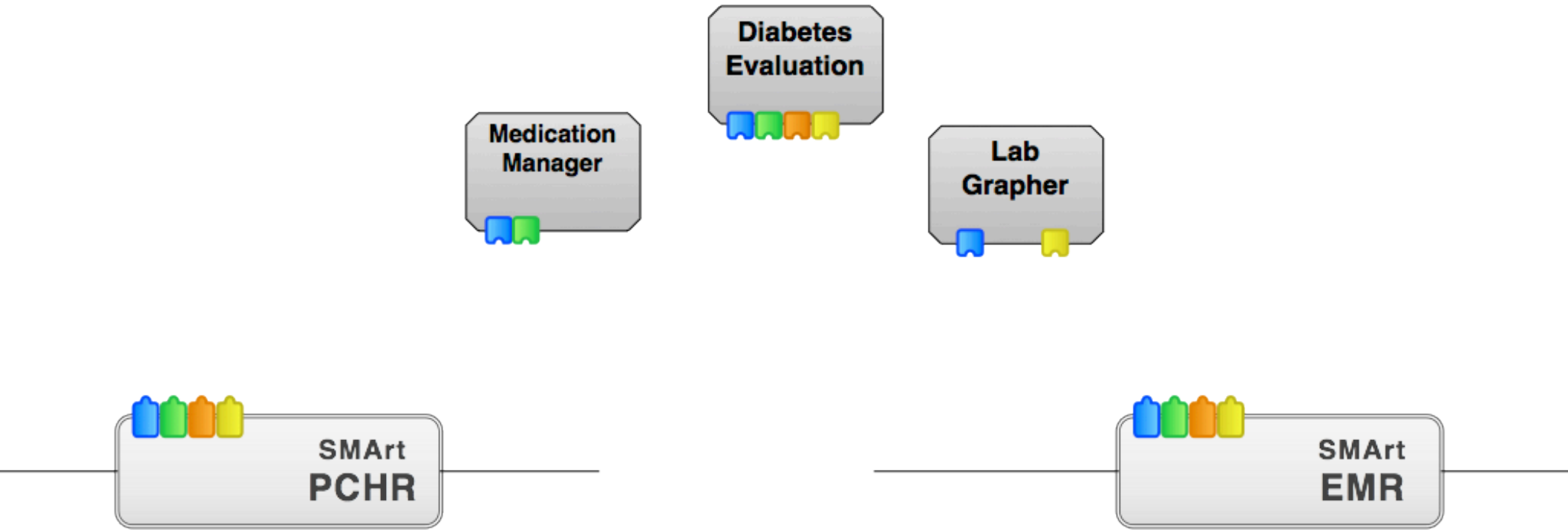
EHR as an "iPhone-like" Platform

- There is a common application programming interface that enables
  - ✓ Software developers to build **SUSTITUTABLE** applications
    - ☞ Push innovation to the edges
    - ☞ Nimbly evolve functionality
    - ☞ Avoid vendor lock
    - ☞ Shrink switching costs
    - ☞ Enable disruption

Our vocabulary:

- Data Sources (managed by containers)
- Containers (present data from data sources to apps in a uniform fashion)
- Apps (completely substitutable)

Substitutability works both ways— the containers can also be swapped out



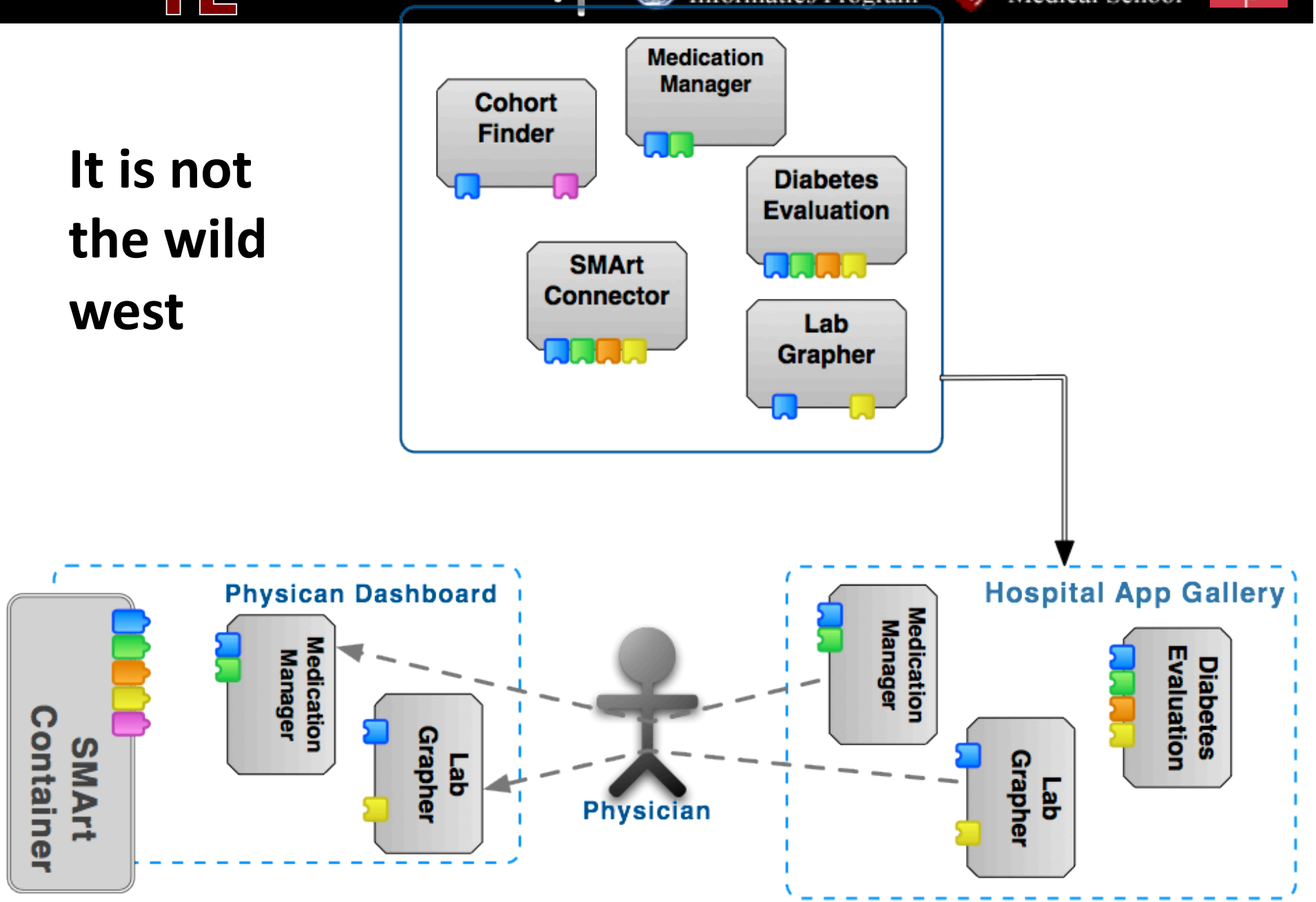
Governance

- **code**: open-source, open formats, led by SMArt team
- **app store**: one app exchange to start, but others can be built. Installations manage their app gallery. Users manage their dashboards.
- **brand**: compliance test to ensure that "SMArt" is meaningful

"App Store"

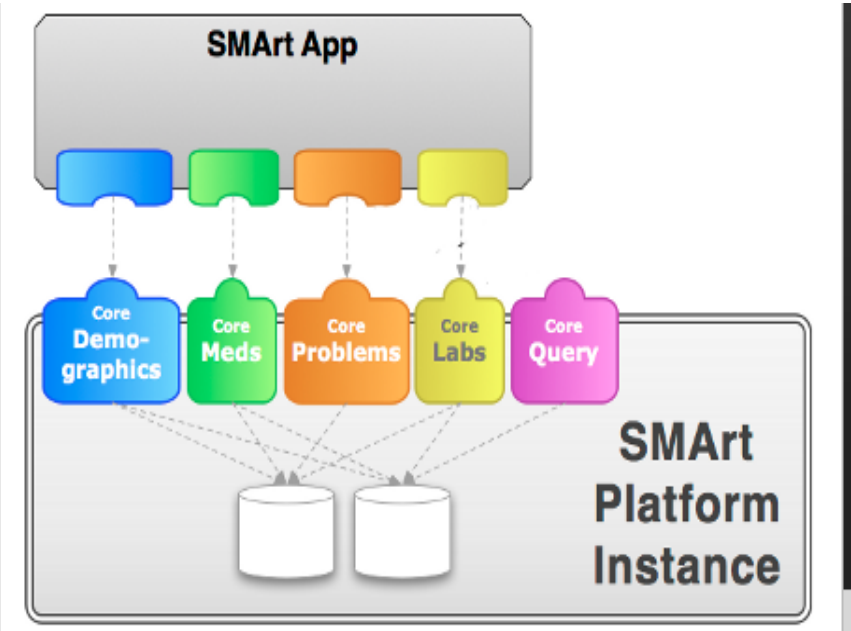
- The SMArt App Exchange will feature apps approved by the SMArt committee
- Other organizations can operate and vouch for alternate app exchanges
- Each SMArt container *installation* will decide which apps it wants to feature in its App Gallery
- Each user may select his preferred apps placed in his App Dashboard

It is not the wild west



Substitutable Medical Apps, reusable technologies

A platform with substitutable apps constructed around core services is a promising approach to driving down healthcare costs, supporting standards evolution, accommodating differences in care workflow, fostering competition in the market, and accelerating innovation.



SMArt Health App $5000 Challenge

As announced by US Chief Technology Officer Aneesh Chopra on November 9, 2010, during his mHealth Summit keynote address with Bill Gates, SMArt seeks to recruit and support a new generation of innovators by providing a common interface to multiple HIT platforms.

The SMArt Health App $5,000 Challenge is to develop web apps that use the SMArt API to provide value to patients, providers, researchers, and public health. Examples of such applications are medication management tools, health risk detectors, and e-prescribing applications. The challenge will open in March 2011. More information is here and you can register your interest in the form to the right.

Challenge Registration

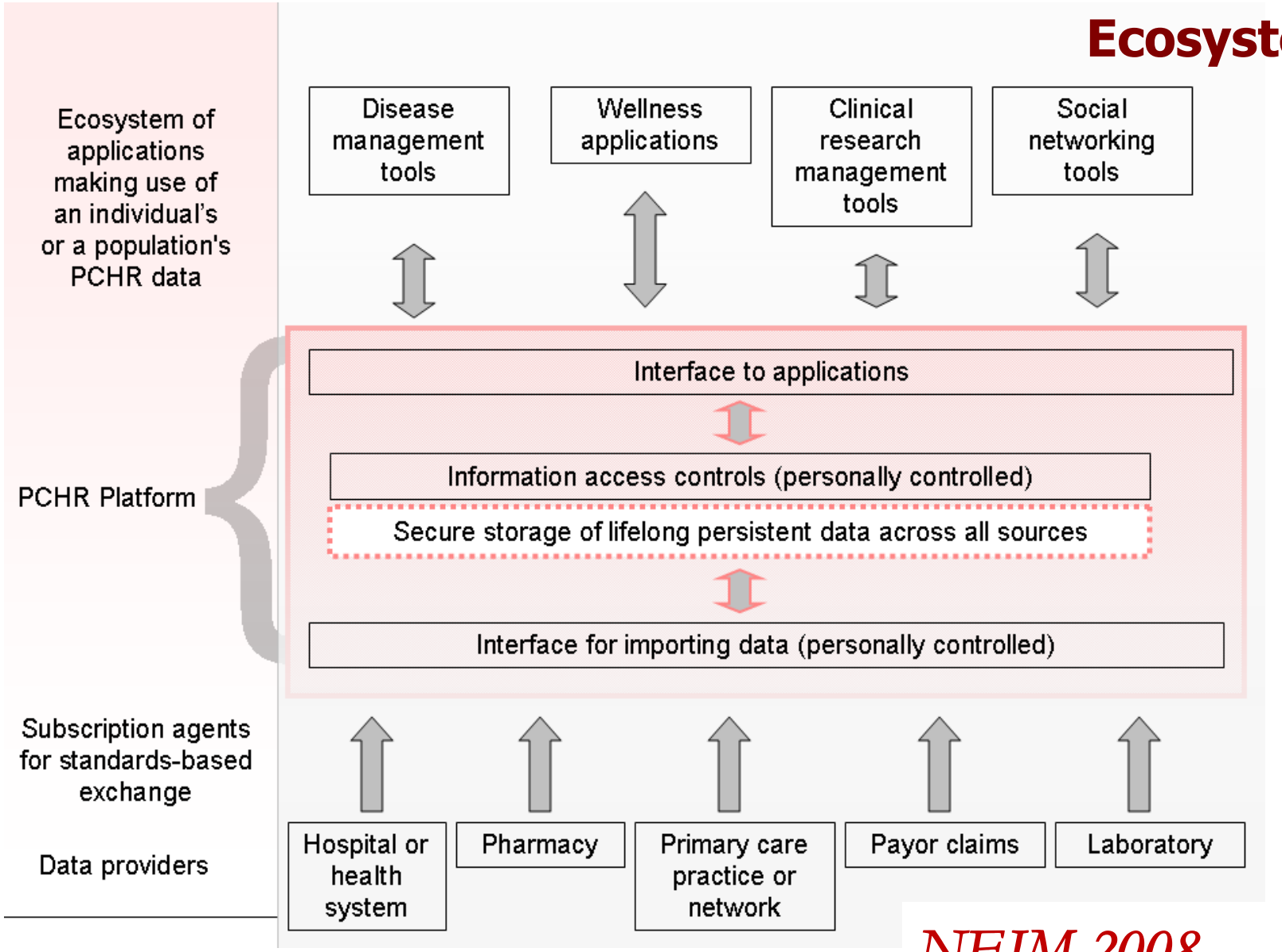
Sign up to register your advance interest in the Challenge. You will receive updates and a link to the formal registration site for the March 2011 SMArt Health App $5,000 Challenge.

First Name:

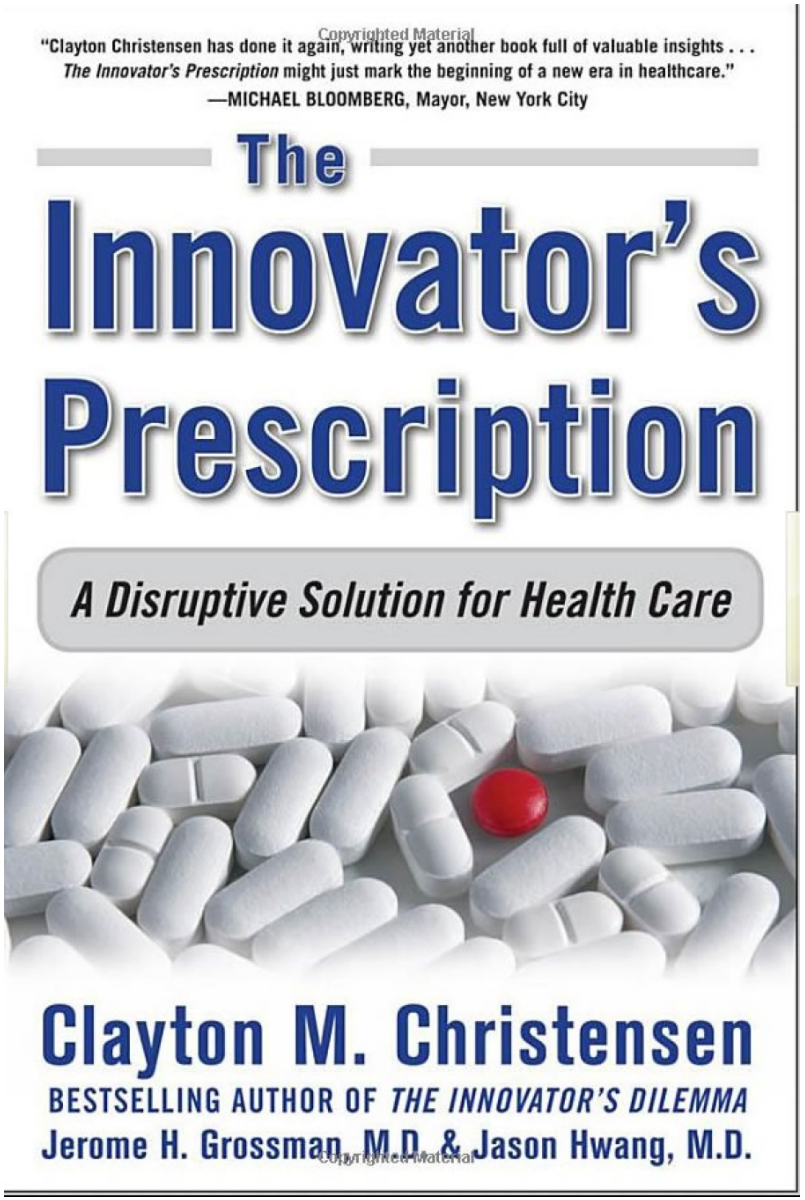
SMArtPlatforms.org

- SMArt Health App $5,000 Challenge
  - ✓ Announced by Aneesh Chopra during keynote with Bill Gates at mHealth last week
  - ✓ Opens in March and allows innovation in MODULAR functionality
  - ✓ Imposes discipline on us to create version 1.0 of the API
  - ✓ Judges:
    - ☞ Regina Herzlinger (Harvard Business School)
    - ☞ David Kibbe (AFP)
    - ☞ Doug Solomon (IDEO)
    - ☞ Edward Tufte (Yale)
    - ☞ Jim Walker (Geisenger)

Ecosystem



NEJM 2008



"We cannot overstate how important PHRs are to the efficient functioning of a low-cost, high quality health-care system . . . . We think that the INDIVO system, or something like it is a good place to start."

--Clayton Christensen

Harvard Business School

2009

Will disruptive innovation be or fostered in healthcare

3 Open Source Systems to build on

- CareWeb EMR
- I2b2 Analytic Platform (NLM Funded)
- Indivo PCHR Platform (NLM and CDC Funded)

Collaborators

- Microsoft
- CVS
- SureScripts
- Cerner
- Recombinant

Federal Interest

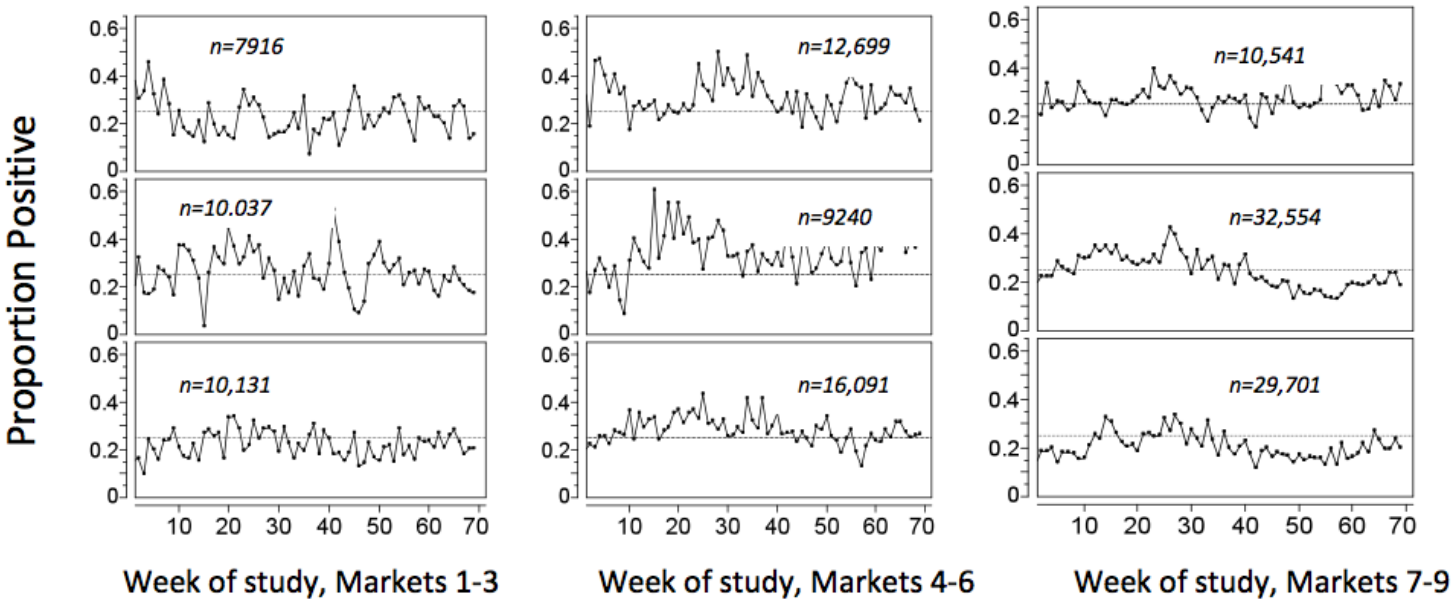
- FDA
- Veteran's Administration
- Indian Health Service

Timeline

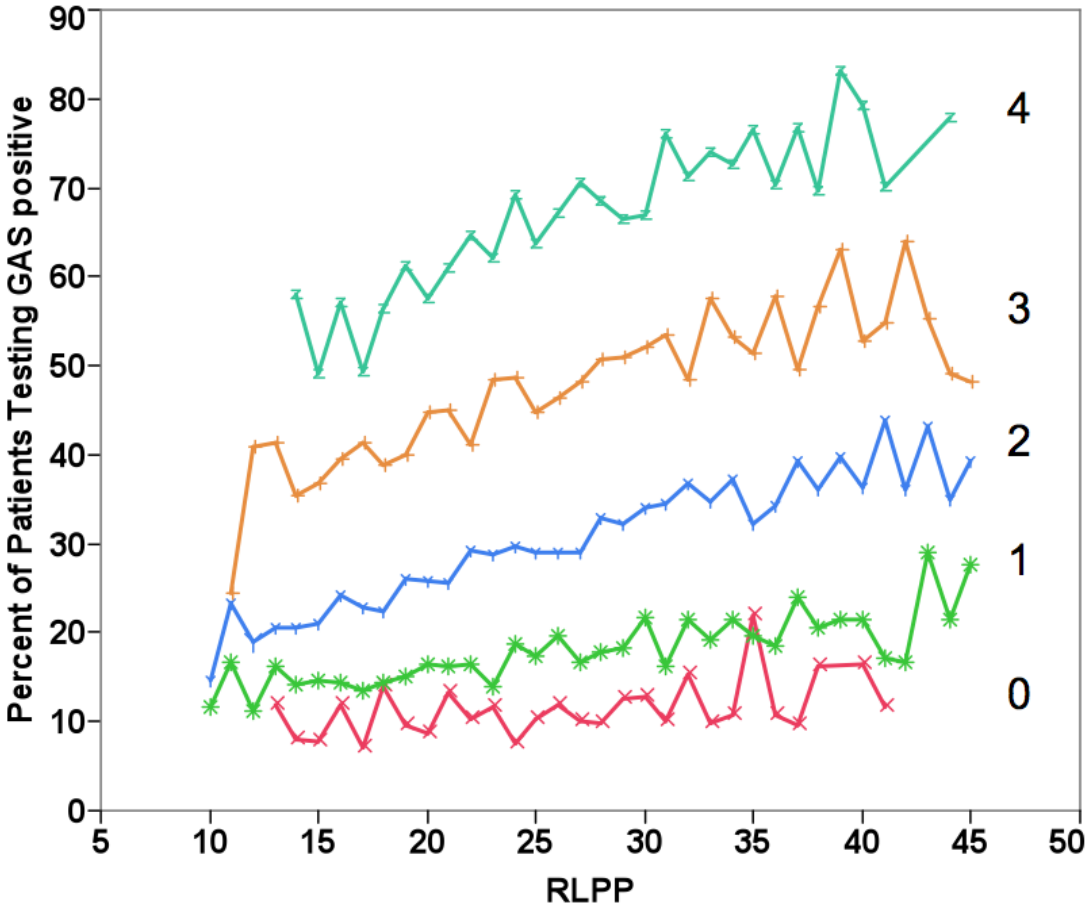
- April 2010-funded
- August 2010-User's meeting with strawman API
- Feb 2011-HIMMS session for vendors
- March 2011-API RC1 and Challenge opens
- June 2011-Challenge winners announced
- April 2012—App store opens

PUBLIC HEALTH SCENARIOS

Contextualization for ID diagnosis



Contextualization



Reportable Conditions

- App to monitor for reportable conditions and solicit physician input?
- New condition??? Then New app!

Next steps

- Consider together:
  - ✓ How to make sure that public health benefits from the $48B investment in HIT
  - ✓ What are the high value public health SMArt Apps
  - ✓ How to leverage the meaningful use certification process for public health